

**Adopted Water Quality Control Plan Amendments,
Total Maximum Daily Load for Heavenly Valley Creek
(including revisions in response to comments and minor non-substantive changes
made following review by the California Office of Administrative Law)**

California Regional Water Quality Control Board
Lahontan Region
2150 Lake Tahoe Boulevard
South Lake Tahoe CA 96150
(530) 542-5400

May 2002

ADOPTED AMENDMENTS TO THE *WATER QUALITY CONTROL PLAN FOR THE LAHONTAN REGION*

I. INTRODUCTION TO NEW SECTION OF BASIN PLAN IMPLEMENTATION CHAPTER CONCERNING TOTAL MAXIMUM DAILY LOADS

A new Section 4.13 of the Basin Plan's implementation chapter will be created with the following introductory language. TMDLs and TMDL implementation plans for specific water bodies and pollutants will be added to this section as they are approved.

“4.13 TOTAL MAXIMUM DAILY LOADS

Section 303(d)(1) (A) of the Clean Water Act requires that “Each State shall identify those waters within its boundaries for which the effluent limitations... are not stringent enough to implement any water quality standard applicable to such waters.” The Clean Water Act also requires states to establish a priority ranking for waters on the Section 303(d) list of impaired waters and to establish Total Maximum Daily Loads (TMDLs) for such waters. TMDLs are essentially strategies to ensure the attainment of water quality standards in impaired waters.

The requirements of a TMDL are described in 40 CFR 130.2 and 130.7 and Section 303(d) of the Clean Water Act. A TMDL is defined as “the sum of the individual wasteload allocations for point sources and load allocations for nonpoint sources and natural background” (40 CFR 130.2) such that the capacity of the water body to assimilate pollutant loadings (the “loading capacity”) is not exceeded. TMDLs are also required to address seasonal variations and to include a margin of safety to address uncertainty in the analysis. In addition, federal regulations (40 CFR 130.6) require states to develop water quality management plans to implement water quality control measures including TMDLs.

The U.S. Environmental Protection Agency (USEPA) is required to review and either approve or disapprove the TMDLs submitted by states. If the USEPA disapproves a TMDL submitted by a state, the EPA is required to establish a TMDL for that water body. Upon establishment of the TMDL by the USEPA, the state is required to incorporate the TMDL, along with appropriate implementation measures, into the state water quality management plan.

This section of the Lahontan Basin Plan contains Total Maximum Daily Loads (TMDLs) for specific water bodies and pollutants. Future TMDLs will be added as they are approved. Background information used to develop each of the specific TMDLs will be retained with the administrative record of the Basin Plan amendments, and will be available to the public on request.”

II. TOTAL MAXIMUM DAILY LOAD AND IMPLEMENTATION PLAN FOR HEAVENLY VALLEY CREEK, EL DORADO COUNTY, CALIFORNIA

The Basin Plan language below will be added to the new Section 4.13 of the Basin Plan implementation chapter. Final Basin Plan revisions will include appropriate changes to the "record of amendments" page and the Table of Contents, List of Figures, Index, bibliography, page numbers and headers to reflect the new material. Final locations of tables in relation to text may be changed to accommodate the Basin Plan's two-column format.

“Heavenly Valley Creek, El Dorado County

Introduction: Heavenly Valley Creek is a tributary of Trout Creek in the southern portion of the Lake Tahoe watershed. The segment of Heavenly Valley Creek within the permit boundaries of the Heavenly Ski Resort is impaired by sedimentation related to historic ski resort development (including roads and ski runs). Sedimentation of Heavenly Valley Creek is of concern not only because of its impacts on instream uses but also because of its cumulative contribution to the degradation of Lake Tahoe. All of the subwatershed affected by the Total Maximum Daily Load (TMDL) for sediment is National Forest land administered by the U.S.D.A. Forest Service, Lake Tahoe Basin Management Unit (LTBMU) and within the permit boundaries of the Heavenly ski resort.

The purpose of this TMDL is to ensure attainment of all sediment-related water quality standards, especially narrative objectives related to protection of instream beneficial uses. (When this TMDL was developed, Heavenly Valley Creek was close to attainment of the numerical suspended sediment objective applicable to tributaries of Lake Tahoe.) The LTBMU has modeled sediment delivery to Heavenly Valley Creek, and reductions in sediment loading expected as a result of ongoing erosion control work. This TMDL is based on LTBMU modeling and monitoring data, interpreted by Regional Board staff to translate hillslope sediment delivery to instream loads. The TMDL implementation program is based substantially on continuation of existing erosion control and monitoring programs which are being carried out under an adaptive management approach by the LTBMU and the ski resort. Progress toward attainment of water quality standards in Heavenly Valley Creek will be evaluated in relation to monitoring data for Hidden Valley Creek, another tributary of Trout Creek with an undisturbed watershed within National Forest lands. A Regional Board staff report (California Regional Water Quality Control Board, Lahontan Region, 2000) provides the technical information supporting the regulatory elements of this TMDL. The staff report should be considered as the reference for all of the information in Tables 4.13-HVC-1 through 4.13-HVC-6 below.

Problem Statement: The water quality standards of concern in relation to this TMDL are beneficial uses related to aquatic life (COLD, RARE, MIGR, and SPWN; see Chapter 2 of this Basin Plan), and narrative water quality objectives for sediment, settleable materials, suspended sediment, and nondegradation (see Basin Plan Chapter 5). Ski resort development began in the Heavenly Valley Creek watershed in 1956, and there is evidence of significant sediment-related impacts on water quality and beneficial uses in

the early 1970s, before adoption of the North Lahontan Basin Plan. The creek has been significantly affected by hydromodification (including a snowmaking reservoir and diversion of part of the creek into a culvert). Monitoring data show that the creek has elevated suspended sediment concentrations and loads compared to the reference stream (Hidden Valley Creek). Problems have been identified with stream channel stability (although improving trends in channel conditions have been documented since the beginning of the erosion control program). The creek has been rated as "marginal" fish habitat since 1982.

Desired Conditions: A variety of parameters, reflecting desired instream and hillslope conditions, have been selected for tracking to evaluate the effectiveness of the TMDL. They are shown in Tables 4.13-HVC-1 and 4.13-HVC-2. Most of these parameters are already being monitored or tracked by the LTBMU. As used in the desired instream conditions, the loading capacity, and load allocations, the term "5 year rolling average" means the arithmetic mean of 5 contiguous annual load estimates (T/yr). For example, in the fifth year, the mean of annual averages for years 1-5 will be calculated. In the sixth year, a new mean, based on data for years 2-6 will be calculated, and so on. The terms "parameter" and "desired condition(s)," as used in this TMDL, are equivalent to the terms "indicator" and "target(s)" as used in USEPA guidance for the development of TMDLs (e.g., USEPA, 1999) and are not meant to have any additional regulatory meaning. The terms "indicator" and "target" will be used in future TMDLs.

Source Analysis: Modeled sediment delivery from various hillslope source categories to Heavenly Valley Creek is shown in Table 4.13-HVC-3. Monitoring data for 1996-99 were used to estimate the instream suspended sediment load, which was converted to a total (suspended plus bedload) sediment load using the assumptions that instream bedload sediment constitutes 20 percent of the total. Since there has been a concerted effort to implement Best Management Practices (BMPs) in the watershed since 1991, instream sediment loads in 1996-99 presumably reflect improved water quality compared to unmitigated conditions. Using information provided by LTBMU staff regarding BMP implementation to date, back-calculations were done to estimate the total unmitigated sediment load (150 tons) shown in Table 4.13-HVC-4. That unmitigated load was divided among hillslope sources using the same relative percentages shown in Table 4.13-HVC-3. Natural sediment loading in Hidden Valley Creek is included in Table 4.13-HVC-4 for reference.

The discrepancy between the estimated hillslope sediment delivery and the instream total sediment load can be attributed partly to the limitations of the sediment delivery model. Sediment delivery is a long term process; other factors contributing to the discrepancy may include temporary storage of eroded sediment on hillslope sites and in ephemeral channels before it reaches Heavenly Valley Creek.

Loading Capacity/Total Maximum Daily Load and Linkage Analysis: The loading capacity for total annual instream sediment loading to Heavenly Valley Creek, measured at the "Property Line" station near the resort permit boundaries, is 58 tons of sediment per year, expressed as a 5 year rolling average. The loading capacity was calculated by

assuming an overall 65% efficiency for BMPs and therefore a 65% reduction in the unmitigated instream sediment load. After consideration of differences in watershed size, this figure is reasonably close to the estimated 45 tons/year total sediment load in the reference stream. Because the wasteload allocation is zero and the TMDL margin of safety is implicit, the loading capacity is also the Total Maximum Daily Load.

It is difficult to predict precise relationships between hillslope sediment delivery and instream conditions because these linkages are often indirect (e.g., temporal and spatial lags between erosion and instream impacts) and because of the seasonal and annual variability in ecosystem processes. This TMDL uses an "inferred linkage" based on comparison of conditions in Heavenly Valley and Hidden Valley Creeks, and a literature review, summarized in the staff report, which indicates that the loading capacity will adequately protect aquatic life uses. Compliance with standards will be measured through long term evaluation of all of the parameters in Tables 4.13-HVC-1 and 4.13-HVC-2. If the desired conditions are attained, erosion rates and sediment delivery should decline to levels which will allow instream habitat and beneficial uses to recover, over time, from the impacts of excessive sedimentation in the past.

Wasteload Allocations: There are no point sources of sediment to the Section 303(d) listed segment of Heavenly Valley Creek, and the wasteload allocation for point sources is zero.

Load Allocations: Load allocations are shown in Table 4.13-HVC-5. The contributions to the mitigated instream sediment load from the "undisturbed lands" and "impervious surface" source categories are assumed not to change as a result of TMDL implementation. The allocation for new development is based on LTBMU modeling data and reflects estimated loading after full application of BMPs. The road and ski run source categories have been given a single load allocation as "historically disturbed lands".

Margin of Safety: The TMDL includes an implicit margin of safety to account for uncertainty in the analysis. Sources of uncertainty include: interpretation of compliance with standards, including narrative objectives and beneficial use support; limited data available for some parameters; limitations of the LTBMU sediment delivery model, and inherent seasonal and annual variability in sediment delivery and instream impacts of sediment.

The TMDL provides a margin of safety by: 1) interpreting compliance with standards through use of multiple parameters to evaluate progress toward desired conditions; 2) incorporating conservative assumptions in the source analysis and development of load allocations; and 3) incorporating a rigorous monitoring and review program and schedule which provides an ongoing mechanism to adjust the TMDL if adequate progress toward attainment of standards is not being made.

Seasonal Variations and Critical Conditions. The TMDL evaluates a variety of parameters in order to integrate the net cumulative effects of sedimentation over longer

time frames. The loading capacity and the load allocations are expressed as 5 year rolling averages to account for natural seasonal and annual variation in sediment loads, with the recognition that trends may not be apparent within shorter time frames. Other parameters are also expressed as long term trends. The TMDL and load allocations are set at levels which, over time, will allow instream aquatic habitat to recover to a level which adequately supports aquatic life uses.

Implementation Measures and Schedule: Implementation is the responsibility of the U.S. Forest Service, Lake Tahoe Basin Management Unit (the landowner) and the Heavenly Ski Resort (an LTBMU permittee). The program of implementation summarized in Table 4.13-HVC-6 is based primarily on continuation of the existing LTBMU erosion control program which requires application of Best Management Practices to all disturbed areas in the ski resort under an adaptive management approach. The implementation program includes full application of Best Management Practices to all new and existing disturbed areas within the ski resort. Implementation also include the monitoring and review and revision programs discussed below.

The Regional Board will use its existing authority, including the Lake Tahoe Basin control measures outlined in Chapter 5 of this Basin Plan, and the three-tier compliance approach (ranging from voluntary compliance to regulatory action) in the statewide Nonpoint Source Management Plan, to ensure implementation of the TMDL. If needed, the Regional Board will use enforcement orders to ensure implementation. The LTBMU and the Tahoe Regional Planning Agency have authority, and have made commitments, to ensure implementation in the Nevada portion of the Heavenly Valley Creek watershed.

Erosion control work within the Heavenly Valley Creek watershed is expected to be complete by 2006. The consequent reduction in hillslope sediment delivery is expected to allow recovery of instream physical conditions to more natural levels, leading to gradual recovery of aquatic life uses. Attainment of instream standards is projected to occur within 20 years after final approval of the TMDLs (by 2021). The technical staff report includes additional information on authority for and commitments to implementation, and demonstrates that there is reasonable assurance of continued implementation and attainment of standards.

Monitoring: The TMDL monitoring program will focus on the parameters listed in Tables 4.13-HVC-1 and 4.13-HVC-2. Suspended sediment concentration and flow will continue to be monitored to enable calculation of annual sediment loads. With the exception of macroinvertebrate community health, all of these parameters are already being monitored as part of the LTBMU's adaptive management program. Most of these parameters are sampled annually; surveys for others, such as the Pfankuch stream channel condition index, are conducted at longer intervals to detect long term trends. TMDL monitoring will include stations in both the Heavenly Valley Creek and Hidden Valley Creek watersheds. The technical staff report for the Heavenly Valley Creek TMDL includes recommendations for sampling locations and frequencies. However, because of the adaptive management approach to implementation, and the pending completion of the first comprehensive review of five years of monitoring data, this

TMDL allows flexibility for modification of the monitoring program over time. No later than 120 days after the final approval of the Heavenly Valley Creek TMDLs, Regional Board staff will reach agreement with LTBMU and Heavenly ski resort staff on initial sampling frequencies and locations for all of the TMDL parameters. This agreement may be formalized either through a Memorandum of Understanding or through modifications to the monitoring program in the waste discharge requirements for the Heavenly ski resort.

Results of the TMDL monitoring will be reported in the annual reports produced by the LTBMU as part of its adaptive management program for the Heavenly ski resort as a whole, and in the projected comprehensive evaluations for this program which are to be produced at five year intervals beginning in 2001.

Schedule for Review and Revision of the TMDL: Regional Board staff will continue to participate in the interagency technical advisory group for the LTBMU's erosion control and monitoring programs. Staff will review the annual and five year monitoring and evaluation reports described above from the perspective of progress toward implementation of controls necessary to meet the load allocations, and toward attainment of water quality standards. If significant progress is not apparent at the conclusion of the second (2005-2006) review, Regional Board staff will evaluate the need for revision of the TMDLs and/or the implementation program.

Table 4.13-HVC-1. Desired Instream Conditions, Heavenly Valley Creek TMDL

Parameter	Desired Condition(s)
<i>Instream Total Sediment Load¹</i>	Maximum 58 tons/year as a 5 year rolling average, as measured at the Property Line monitoring station-
<i>Geomorphology Measures</i>	
Pfankuch channel stability rating (composite rating includes numeric scores for 15 different indicators) ²	Increasing trend over time from "fair-poor" to "good" (comparable with overall rating of Hidden Valley Creek)
USFS Region 5 "Stream Condition Inventory" (SCI) ²	Improving trends in channel morphology over time
<i>Biological Parameters</i>	
Macroinvertebrate community health-	Improving trends in benthic invertebrate community metrics over time, approaching conditions in Hidden Valley Creek

¹ Incorporated by reference in CRWQCB, Lahontan Region ,2000 (technical staff report, Sections 3.2 and 3.5, with May 2002 supplement.

² Incorporated by reference in U.S. Forest Service, 1996 (pages 5-2 to 5-9); U.S. Forest Service, 1997, pages 5-1 to 5-9; Hazelhurst and Widegren ,1998, and Hazelhurst *et al.*, 1999 (annual U.S. Forest Service Heavenly Ski Resort environmental monitoring reports).

Table 4.13-HVC-2. Desired Hillslope Conditions, Heavenly Valley Creek TMDL

Parameter	Desired Condition(s)
Watershed disturbance ¹	Schedules in ski resort master plan mitigation program (TRPA 1995, 1996) for implementing and maintaining BMPs for roads and ski runs are met, with progress and BMP effectiveness reported annually and evaluated at 5-year intervals
Effective soil cover (vegetation, woody debris, organic matter, rocks) on ski runs and roads ²	Cover meets modeled mitigation targets set for specific road/run segments in watershed, and overall cover rating is "good" or better using LTBMU evaluation criteria

¹ Incorporated by reference in Tahoe Regional Planning Agency (TRPA) Draft EIR/EIS/EIS for Heavenly Ski Resort Master Plan (1995), pages 4.1-50 to 4.1-72 (CWE Soil Erosion Reduction Program) and Appendices H and I; TRPA (1996), pages 6.4-1 to 6.5-6 (Revised Mitigation and Monitoring Plan); and U.S. Forest Service (1998), Appendix G (CWE Technical Memorandum No. 1).

² Incorporated by reference in TRPA (1995) Appendix I, Road and Run Segment Mitigation Tables; Hazelhurst and Widegren (1998) pages 3.1 to 3.13 (on effective soil cover evaluation); and Hazelhurst *et al.*, 1999, pages 3.1 to 3.7 and 6.3 to 6.7 (on effective soil cover evaluation).

Table 4.13-HVC-3. Modeled Sources of Upland Sediment Delivery to Heavenly Valley Creek. (Sediment delivery figures are for the 1341 acre watershed. Data are from TRPA 1995, 1996, with changes by Regional Board staff as explained in the staff report.)

Source Category	Area (acres)	Sediment Delivery (tons/year)	Percent of Total Load
Roads	19	349	62
Ski Runs	182	176	32
Impervious surface	1	0 ¹	0 ¹
Undeveloped Area	1119	34 ²	6
TOTAL	1341	559	100

¹ Sediment delivery from impervious surface is considered "de minimis".

² Number rounded upwards

Table 4.13-HVC-4. Source Analysis for Instream Total Sediment Loading to Heavenly Valley and Hidden Valley Creeks (Loads are estimated *unmitigated* values, rounded to the nearest ton.)

Source Category	Loading (Tons/Year)	Percent of Total Load
<i>Heavenly Valley Creek</i>		
Roads	93	62
Ski Runs	48	32
Undisturbed Lands	9	6
Impervious Surface	0 ¹	0
TOTAL	150	100%
<i>Hidden Valley Creek</i>		
Undisturbed Lands	45	100%
TOTAL	45	100%

¹ Sediment delivery from impervious surface is considered "de minimis".

Table 4.13-HVC-5. Instream Load Allocations for Total Sediment in Heavenly Valley Creek (measured at the Property Line Station)

Source Category	Load Allocation (tons/year as a 5 year rolling average)
Historically Disturbed Lands	48
New Development	0.7
Undisturbed lands	9
Impervious surface ¹	0
TOTAL	57.7²

¹ The contribution of impervious surface to sediment loading is considered *de minimis*. See the text.

² The discrepancy between the total load allocations and the loading capacity (58 tons/year) is considered to be within the margin of error of the calculations.

Table 4.13-HVC-6. Summary of TMDL Implementation Program

Implementation Measure	Schedule
Abandon and restore 7.59 acres of existing unpaved roads ¹	Complete by 2006
Stabilize 21.10 acres of existing roads which will remain in use ¹	Complete by 2006
Restore 182 acres of existing ski runs ¹	Complete by 2006
Maintain BMPs as necessary ¹	Annually
Review success of specific BMPs at specific sites; identify and implement improvements through adaptive management approach ¹	Annually
Conduct a comprehensive review of progress toward watershed restoration and attainment of water quality standards and identify needs for change through adaptive management program. ¹	At five year intervals beginning in 2000: (first evaluation report completed in 2001)-

¹ Incorporated by reference in Tahoe Regional Planning Agency (TRPA) Draft EIR/EIS/EIS for Heavenly Ski Resort Master Plan (1995), pages 4.1-50 to 4.1-72 (CWE Soil Erosion Reduction Program) and Appendices H and I; TRPA (1996), pages 6.4-1 to 6.5-6 (Revised Mitigation and Monitoring Plan); Hazelhurst and Widegren (1998); Hazelhurst *et al.* (1999); and U.S. Forest Service (1998), Appendix G (CWE Technical Memorandum No. 1)."

Bibliography

The following references will be added to the Basin Plan bibliography. These documents are incorporated by reference into the Basin Plan. Incorporation will be shown by a footnote in the bibliography. Copies of these documents will be maintained in the administrative record for the TMDL or in the library at the Regional Board's South Lake Tahoe office.

California Regional Water Quality Control Board, Lahontan Region, 2000. *Technical Staff Report: Total Maximum Daily Loads for Sediment and Implementation Plan, Heavenly Valley Creek, El Dorado County, California with May 2002 supplement .*

Hazelhurst, S. and B. Widegren, 1998. *Heavenly Ski Resort 1997 Environmental Monitoring Report.* U.S. Forest Service, Lake Tahoe Basin Management Unit.

Hazelhurst, S. B. Widegren, and M. Greene, 1999. *Heavenly Ski Resort 1998 Environmental Monitoring Report.* U.S. Forest Service, Lake Tahoe Basin Management Unit.

Tahoe Regional Planning Agency, 1995, 1996. *Draft and Final Environmental Impact Report/Statement, Heavenly Ski Resort Master Plan, 5 volumes.*

U.S. Environmental Protection Agency, 1999. *Protocol for Developing Sediment TMDLs*, First Edition. Office of Water, Washington D.C. EPA 841-B-99-004.

U.S. Forest Service, Lake Tahoe Basin Management Unit, 1996. *Heavenly Ski Resort 1996 Annual Monitoring Report*, Chapter 5, Riparian Condition Assessment.

U.S. Forest Service, Lake Tahoe Basin Management Unit, 1997. *Heavenly Ski Resort 1997 Annual Monitoring Report*, Chapter 5, Riparian Condition Assessment.

U.S. Forest Service, Lake Tahoe Basin Management Unit, 1998. *Heavenly Ski Resort Gondola Project Environmental Assessment/Negative Declaration, Appendix G, CWE 1998 Technical Memorandum No. 1*.

